USER MANUAL

VTR4 Strobe Light

Revision 1

Gardasoft Vision Ltd
Castle Acres, Elsworth
Cambridge, CB23 4JQ. UK
Tel: +44 1954 200343
Fax: +44 1954 204343
Web: www.gardasoft.com

1 Disclaimer

Except as prohibited by law:

- All hardware, software and documentation is provided on an “as is” basis. This information is for guidance only. Installers must perform their own risk assessment specific to each installation.
- It is essential that the user ensures that the operation of the product is suitable for their application.
- The user must ensure that incorrect functioning of this equipment cannot cause any dangerous situation or significant financial loss to occur.
- Deliberate acts of endangerment and vandalism are not covered by this document and must be considered by the installer.
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2 Getting Started

Read the sections on Safety (Sections 3 and 4) and Specifications (Appendix A) and check the VTR4 fulfils your requirements. See the back cover for other Gardasoft Vision strobe lights.

Mount the VTR4 as described in Section 4. Connect the VTR4 up to a supply as described in Connections (Section 5). Set up the VTR4 for the desired operation as described in Configuration Commands (Section 9).

Visit www.gardasoft.com for application notes on this product. There is also a Support page which has information on troubleshooting problems.

2.1 Summary of Features

Throughout this manual, references to the VTR4 refer to all variants in the VTR4 range unless otherwise stated. The convention for the part number is:

VTR4-www-aa-ccc

where:

www	Wavelength of light in nanometres: 740, 850, 940, WHITE
aa	Beam angle in degrees: 12 or 30
ccc	Communications: ETH, RS232
-T06	Optional suffix for trigger input option
-T07	Optional suffix for trigger output option

3 Safety

Read this before using the VTR4. Always observe the following safety precautions. If in doubt, contact your distributor or Gardasoft Vision. The following symbols mean:

Warning: read instructions to understand possible hazard

Warning: Possible hazardous voltage

Warning: Surface may get hot

Where these symbols appear in the manual, refer to the text for precautions to be taken.

3.1 Heat

The VTR4 can dissipate up to 80W and so can get hot. It should be positioned where personnel cannot accidentally touch it and away from flammable materials.

Read the Mounting (Section 4). Do not exceed the power ratings given in the manual. Note that at the maximum ratings the case temperature can reach 65ºC.

3.2 Electrical

The internal circuit exceeds 46.7V but should not exceed 60V. Pulse peak voltages above 46.7V are considered hazardous. Do not have the cover removed with the power on. Do not open the cover within 5 minutes of turning the power off.

The VTR4 does not have complete tracking isolation of inputs and outputs.

3.3 General

The VTR4 must not be used in an application where its failure could cause a danger to personal health or damage to other equipment.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

4 VTR4 Safety Guidance

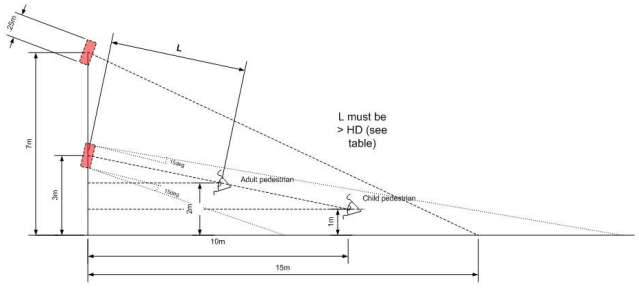
This guidance below applies to a single VTR4 light. For VTR4 lights with a beam angle wider than 12 degrees, the power density is less so again the recommended hazard distance above is a safe assumption.

⚠ High levels of artificial optical radiation can cause damage to both eyes and skin. Exposure limit values have been drawn up for such hazards. Every light system is placed within a Risk Group, which defines the level of risk when the light is used normally. When the light emits less than the exposure limit values it is categorized as exempt.

See table 4.1 for the risk groups of the various specifications of VTR4.

The hazard distance is the point furthest from the light at which the exposure limit is exceeded. Generally the hazard distance becomes smaller either as the light power output decreases or the less time one is exposed to the light.

When used to illuminate targets for speed cameras, the risk assessment has taken into account the position of drivers and pedestrians and the likely times that they may be within the light beam. This includes abnormal situation such as cars queuing for long periods due to traffic conditions



Typical mounting heights for traffic camera applications
(drawing not to scale)

For IR models the light output is not visible and thus the aversion response does not automatically protect the eye. The white models will cause the eye to blink, but are not necessarily safer because of the strong spectral peak in the blue.

When installed as detailed herein, there is no risk to the public. If it is necessary to have the light operating whilst being within 1.0m of the lightface, use appropriate eye protection.

Development engineers and field maintenance staff should be given safe procedures for working with the VTR4 light. This guidance assumes that staff working on the light system has been instructed in optical radiation hazards. To allow access to the light within the beam a working distance of 0.5m is used as a hazard distance, which allows an exposure time to be calculated.

4.1 Safe Distances for Full Power Operation

The following table applies for lights running at full power and maximum duty cycle.

Product	Risk to	Hazard Distance (m)	Risk Group	Comments
VTR4-740-12 **VTR4-850-12** **VTR4-940-12**	Drivers and pedestrians	TBD	1	No exposure time limit. Ensure that light is mounted at a height such that distance L always exceeds the hazard distance (HD)
VTR4-WHITE-12	Drivers and pedestrians	TBD	2	No exposure time limit. Ensure that light is mounted at a height such that distance L always exceeds the hazard distance (HD)
VTR4-740-12 **VTR4-850-12** **VTR4-940-12**	Maintenance staff	TBD	1	Maximum exposure time 5 minutes or wear eye protection prior to entering beam.
VTR4-WHITE-12	Maintenance staff	TBD	2	Wear eye protection prior to entering beam.

Safe Power for Short Distances

Product	Risk to	Downrating for a member of the public at 0.1m from the light	Downrating for a member of the public at 0.2m from the light
VTR4-740-12	Drivers and pedestrians	25%	30%
VTR4-850-12	Drivers and pedestrians	15%	20%
VTR4-940-12	Drivers and pedestrians	35%	40%
VTR4-WHITE-12	Drivers and pedestrians	5%	10%

Downrating is the amount that the light must be reduced from full power to make it safe. For example when full power is 100% intensity at 2% duty cycle, 25% downrating would be:

25% intensity at 2% duty cycle,

or 100% intensity at 0.5% duty cycle.

In both cases the radiated power is 25% of full power.

4.2 Product Labelling

The IR versions of this product are labelled:

Risk Group 1
WARNING IR emitted from this product

The white versions of this product are labelled:

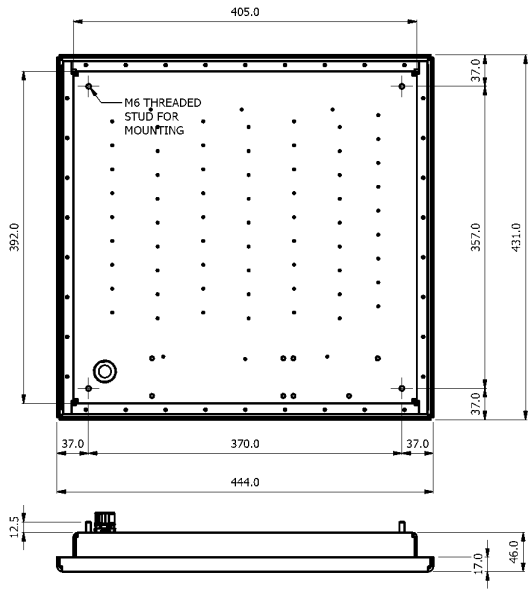
Risk Group TBD
LED RADIATION DO NOT STARE INTO BEAM CLASS 2 LED PRODUCT

4.3 Disclaimer

This information is for guidance only. Installers must perform their own risk assessment specific to each installation. While Gardasoft Vision has taken every care in the preparation of this advice, Gardasoft Vision and Gardasoft Products accept no liability for damages of any kind, except those required by law.

Deliberate acts of endangerment and vandalism are not covered by this document and must be considered by the installer.

5 Mounting



5.1 Heatsinking

The approximate heat dissipation of the VTR4 can be calculated as follows:

HD = (36 * BR * PW * TF) + 2

Where:

HD	Heat dissipation (W)
BR	Brightness of the light output (%)
PW	Strobe pulse width (seconds)
TF	Maximum trigger frequency (Hz)
BR	Brightness of the light output (%)

Without any heatsinking, the internal temperature of the VTR4 rises 0.45ºC per Watt of heat dissipation. Given the range of ambient temperatures and radiated sunlight, the installation must provide enough heatsinking on the rear surface to keep the internal temperature of the VTR4 below 70ºC.

6 Connections

See the Specification (Appendix A) for information on connection ratings.

Assembled cables are available from Gardasoft Vision to the customer's specification.

All connections are provided on a 14 core cable. The wire allocation varies depending on the options provided.

Wire Colour	ETH option	RS232 option
Blue Black Grey/Pink	POWER –	POWER –
Red Red/Blue Violet	POWER +	POWER +
White	TRGI –	TRGI –
Brown	TRGI +	TRGI +
Grey	TX+	No connect
Pink	TX–	TXD (9 way D-type pin 2)
Yellow	RX+	RXD (9 way D-type pin 3)
Green	RX–	GND (9 way D-type pin 5)
Yellow/White	TRGO–	TRGO–
Yellow/Brown	TRGO+	TRGO+

6.1 Power Supply

Choose a PSU that limits its output current by design, by setting the current limit on the supply (if this feature exists) or use fuses. Remember to derate the fuse, if mounted in an enclosure, as the temperature will be higher than ambient. The external power supply needs to be able to supply at least 4.0A.

The use of a regulated power supply with 100% short circuit protection is recommended. If however a non-regulated power supply is used, then the maximum ripple voltage of this power supply must not exceed 10% of the actual DC value.

The low voltage and AC mains wiring should be routed separately. If they must be loomed together ensure that low voltage insulation rating is sufficient or that supplementary insulation is used.

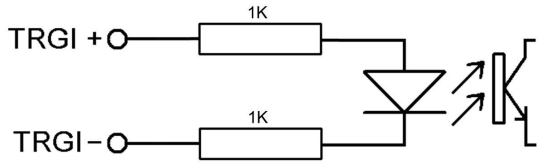
The maximum recommended power supply cable length 3m. If longer cables are fitted, or if surge or transient interference greater than +/-60V may occur on the power supply lines, additional surge protection should be provided.

6.2 Trigger Input Option

There is an optional opto-isolated trigger input. The opto-isolator isolates voltages up to 50V.

Signal	Function
TRGI –ve	Trigger input –ve.
TRGI +ve	Trigger input +ve.

The trigger input circuit is as follows:



The trigger input circuit is as follows:

When a voltage of 5V to 24V is applied across TRGI –ve and TRGI +ve, the trigger input is logic 1 (on). When a voltage of 0V to 2V is applied across TRGI –ve and TRGI +ve, the trigger input is logic 0 (off).

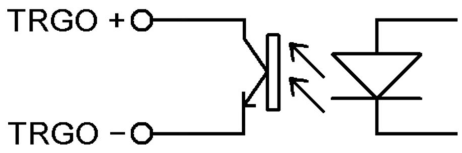
The trigger input takes about 3mA at all voltages from 5V to 24V.

6.3 Trigger Output Option

There is an optional trigger output which is opto-isolated. The opto-isolator only isolates voltages up to 50V.

Signal	Function
TRGO –ve	Trigger input –ve.
TRGO +ve	Trigger input +ve.

The trigger output circuit is as follows:



The trigger output can be used to switch a signal of up to 24V, switching up to 20mA when on.

When the output is logic 1 (on) a current of up to 20mA can flow. The max current must be limited to 50mA by the external circuit. The forward voltage is less than 2V.

When the output is logic 0 (off) a voltage of up to 24V can be blocked.

6.3.1 Ethernet Option

The Ethernet connection is 10BaseT and runs at 10Mbits per second.

6.3.2 Serial Option

The RS232 connections are as follows. The communications port should be set to 115Kbaud, no parity, 8 data bits, 1 stop bit.

Connecting to the specified pin on a 9-way female D-type allows straight through connection to a PC COM port.

Signal	Function	Connection pin on a standard PC 9-way Female D-Type
GND	Connected to power input –ve	5
RX	Receive input to VTR4	3
TX	Transmit output from VTR4	2

7 General Description

The VTR4 current controller provides repeatable intensity and timing control for strobe lighting.

Two modes of operation are provided for the light output:

- **Pulse (Strobe)**:

  In pulse mode output is pulsed once per trigger. One trigger input is used as a trigger. The delay from trigger to pulse, the pulse duration and the brightness can be set.

- **Switched:**

  In switched mode a trigger input can be used to switch the output current on and off. The sense of the trigger signal can be active high or active low.

The set up is non-volatile, so the VTR4 resumes the same operation after a power cycle.

7.1.1 Pulse and Duty Cycle Limits

In both pulsed and switched modes, the pulse width and duty cycle are internally limited to prevent damage to the light.

The brightness can be set up to 100%, but only for short periods and at low duty cycles, so that the lighting does not overheat and get damaged. In pulse mode, the duty cycle is limited by ignoring triggers which are too soon after the previous trigger.

Output Brightness	Allowed Pulse Width for 850nm and 940nm lights	Allowed Duty Cycle for 850nm and 940nm lights	Allowed Pulse Width for white and 740nm lights	Allowed Duty Cycle for white and 740nm lights
0 to 20%	3ms	6%	3ms	3%
21 to 30%	3ms	6%	2ms	3%
31% to 50%	3ms	3%	2ms	2%
51% to 100%	1ms	2%	1ms	1%

So for example, if the brightness is set to 40%, then a VTR4-850 does not allow pulses greater than 3ms long. With 1ms pulses, if a trigger occurs within 33ms of a previous trigger (so that the duty cycle would be greater than 3%) the trigger is ignored.

If necessary the VTR4 limits the duty cycle by increasing the retrigger delay.

When the VTR4 internal temperature gets too high, the allowed duty cycle is reduced and event 149 is generated. This typically happens at 50°C.

7.1.2 Pulsed Output

The output is off by default. When the VTR4 is triggered it waits for a delay and then pulse the output.

Retrigger delay is the minimum allowed time from one trigger to the next. Any triggers that happen too soon after the previous trigger are ignored. The retrigger delay is set in multiples of 100us.

The delay, pulse width, retrigger delay and pulse intensity are all configurable.

7.2 Switched Output

Switched mode uses the trigger input to switch the output on or off using the timing of the trigger signal. The output brightness can be varied from 0% to 100%.

The VTR4 applies the same duty cycle and pulse width limits as for pulse mode, to prevent the light being damaged.

7.3 Internal Trigger Timer

An internal timer is available for continuous triggering in pulse mode. The period of this timer is configurable.

Note that the internal timer is mostly used when synchronising a camera using the trigger output. It is generally not possible to run the light strobe from this timer while free running the camera as they will not remain synchronised and the images will have very variable intensity.

When this timer is turned on, the light strobe pulse and the trigger output are both triggered by this timer. External triggers still work.

When troubleshooting during development, it is sometimes useful to set this timer to give regular light pulses.

7.4 Trigger Input Option

An optional trigger input signal is available.

The trigger input is used as follows:

Mode	Trigger Input	Output
Switched	Trigger input = off	Output is off if P flag = 1 Output is on if P flag = 0
	Trigger input = on	Output is on if P flag = 1 Output is off if P flag = 0
Pulsed	Trigger rising edge	Pulse is triggered if P flag = 1
	Trigger falling edge	Pulse is triggered if P flag = 0

Note that the P flag inverts the sense of the trigger input.

7.5 Trigger Output Option

An optional trigger output signal is available.

When fitted, this signal can be used to trigger a camera. It can be used for pulse width exposure control of the camera. The trigger timing for the light and camera can be adjusted relative to each other.

This output is triggered at the same time as the light strobe output. The delay and pulse width for this signal can be controlled independently of the light pulse.

7.6 Factory Settings

The default VTR4 configuration for the light output and trigger output are:

- Pulse operation
- 1ms pulse width
- 0.01ms delay
- 50% intensity
- 30ms retrigger delay

The configuration can be cleared to the default settings, by sending the CL command.

8 Ethernet Address (Ethernet Version Only)

You may need to ask your network administrator for advice about setting up the Ethernet connection.

Ethernet set up is not affected by cold booting the VTR4.

8.1 Connection

The Ethernet link uses a 10 base-T connection on an RJ45 connector. The VTR4 is usually connected to a network switch (or hub or router). It is also possible to connect it direct into the network port on a PC by using a crossover cable.

8.2 IP Address

The VTR4 needs an IP address to communicate over Ethernet. There are two ways to get an IP address; either programmed into the unit or using DHCP.

Most networks use a DHCP server. If there is a PC on the network, You may be able to find out whether a PC on the same network uses DCHP as follows:

- Go to Control Panel
- Select Network Connections
- Right click on Local Area Connection. Select Properties
- From the list, select Internet Protocol (TCP/IP), press Properties

If “Obtain an IP address automatically” is set, then DHCP is probably used. However, there may be an alternative fixed IP address on the “Alternative Configuration” tab.

You can find out what IP address is being used by a PC at any time by:

- Go to Control Panel
- Select Network Connections
- Right click on Local Area Connection. Select Status
- Select the Support tab. The IP address is displayed

When using a fixed IP address, you must ensure that you use an IP address that is not being used by any other device on the network. It is usual to keep the first three numbers of the IP address the same as other devices and to change only the last number. For example, if you have a network consisting of a PC (IP address 192.168.1.35) and two VTR4s, you might give them addresses 192.168.1.201 and 192.168.1.202.

8.2.1 Programmed IP Address and DHCP

For DHCP mode, the VTR4 acquires its IP address, subnet mask and gateway address from a DHCP server. Otherwise the VTR4 has a fixed IP address, subnet mask and gateway address.

DHCP mode or the IP address can be set and read the VTR4 Configuration Program available for download at www.gardasoft.com.

8.2.2 Automatic Sensing

All the features below are implemented in a Configuration Program with C++ source code available from www.gardasoft.com.

The VTR4 sends out a message on three events:

- On power up
- When an IP address is received or renewed by DHCP
- When an enquiry message is received

On the first two events, the message is broadcast. On the third it is a reply to a single IP address.

An enquiry message is a UDP packet from source port 30310, destination port 30311 with the message body “Gardasoft Search” (8-bit ASCII, 13 characters).

The message output by the VTR4 is a UDP packet from source port 30311, destination port 30310. It is formatted as:

Gardasoft,VTR4,000000,111111111111,22222222

(8-bit ASCII, 44 characters), where

000000	the serial number of the unit
111111111111	the MAC address in 6 HEX bytes
22222222	the IP address in 4 HEX bytes

For example for VTR4 serial number 12345, IP address 192.168.1.103, MAC address 00.0B.75.01.80.99 the packet contains:

Gardasoft,VTR4,012345,000B75018099,C0A80167

9 Webpage Configuration (Ethernet Version Only)

The VTR4 has a webserver inside, so that it can be configured from a standard web browser, such as Internet Explorer.

The IP address of the VTR4 must be known (see section 7 on Ethernet Address. Open a web browser window and type the IP address (for example 192.168.1.71) of the VTR4 into the URL box at the top. The main page of the VTR2 webserver should be shown.

9.1 Main Page

The main page shows general information about the VTR4. Links are provided to the configuration pages.

9.2 General Setup Page

The General Configuration page allows the webpage protection password to be set or cleared and the internal trigger to be set up. Also any Ethernet command from Section 9 can be entered.

“Test Mode” referred to on this page is the internal trigger timer.

9.3 Light Configuration Page

This page allows the parameters for the light output to be set up. Press the Submit button to update the VTR4 and save the changes to non-volatile memory.

Some measured values are displayed on this page.

9.4 Trigger Output Configuration Page

This page allows the parameters for the trigger output to be set up. Press the Submit button to update the VTR4 and save the changes to non-volatile memory.

10 Configuration Commands

The VTR4 can be configured via the Ethernet connection using UDP or TCP/IP. A Configuration Program with source code can be downloaded from www.gardasoft.com.

10.1 Ethernet Communication

For TCP, commands from a host should be sent to destination port 30313. Replies are sent to destination port 30312. For UDP, commands from a host should be sent from source port 30312 to destination port 30313. Replies are sent from source port 30313 to destination port 30312.

10.2 RS232 Communication

When using RS232, the COM port should be set to 115200baud, 8 data bits, no parity, 1 stop bit, no handshaking.

10.3 Command Structure

Communication consists of commands sent by the host (controlling PC). All output generated by the command is returned in reply UDP or TCP/IP packets. The last character sent is “>” (“greater than” symbol). Once this is received, the host knows that the command has been completed.

It is recommended that the host waits for the “>” symbol before sending the next command. UDP communications are not guaranteed to arrive, so the host software must be able to cope with lost messages.

Using the GT command, a host can request that a message is sent to it whenever an error occurs.

Several commands can be put into one command line by separating them by a semi-colon (“;”). A carriage return character should be sent to terminate the command line. The VTR4 sends any replies to the commands and then send a ‘>’ character to indicate that the command line has been completed.

Commands comprise a code of two letters followed by the parameters (if any) needed for the command. Spaces in the commands are ignored.

Numeric parameters are separated by a comma (“,”). For a parameter which is a time period the default units are milliseconds. “s”, “ms” or “us” can be added to the end of the number to indicate seconds, milliseconds or microseconds**.** For example:

Parameter	Meaning
0.1	0.1 milliseconds
200us	200 microseconds
0.1s	0.1 seconds

Note that parameters are in “USA/UK” format so that a half is written “0.5” not “0,5”

The command codes and their meaning are described below. The upper case commands are shown, followed by lower case letters denoting the numeric argument.

Error number	Reason
Err 1	A parameter value is invalid
Err 2	Command not recognised
Err 3	Numeric value is wrong format
Err 4	Wrong number of parameters
Err 5	(This is only a warning) A timing parameter was out of range and has been adjusted to a valid value.

Any changes made using Ethernet commands are not saved permanently until the AW command has been issued.

10.3.1 General Commands

Report the version of firmware running in the VTR4
VR
This command returns the firmware version. For example:
VTR2 (HW001) V001

Set switched mode

The output is set to switched mode at a percentage of full brightness.
RW1,s
Where:
s = setting in percent (s = 0 to 100)

Set pulse mode

The output can be set up to pulse on a trigger input. The delay from trigger to the start of the pulse, the length of the pulse and the brightness are configurable.

An error is generated if the brightness setting requires a current greater than 20A or if the combination of pulse width and setting is not allowed.

RTc,p,d,s
RTc,p,d,s,r
Where:
c 1 = Light strobe output , 2 = Trigger output signal
p = pulse width in milliseconds (0.01 to 3)
d = delay from trigger to pulse in milliseconds (0.01 to 999)
s = setting in percent (s = 0 to 100)
r = retrigger delay in milliseconds. This parameter is optional

Set the Option Flags

REc,p

Where:

c	1 = Light strobe output , 2 = Trigger output signal
p = 0	P flag set (positive triggers)
p = 4	P flag cleared (negative triggers)

Set Internal Trigger

Enable or disable the internal trigger. When enabled, all outputs are triggered simultaneously using an internal trigger signal. This setting can be saved to non-volatile memory using the AW command.

TT0	Disable internal trigger
TT1	Enable internal trigger (uses previously set period)
TT1,p	Enable internal trigger and set the period

Where:

p= period of the triggers in microseconds

For example:

TT1,200	Set the internal trigger to 200ms (5Hz)
TT1,1S	Set the internal trigger to 1 second (1Hz)

Save the settings to memory

AW

The results of the RW, RT, RE, TT commands are all saved. Once the settings are saved to memory they are then retained when the unit is switched off. If this is not done, changes to the settings are volatile, and if the unit is switched off they revert to those in force when the last AW command was issued.

Clear Configuration

CL

Clears the configuration. The results of the RW, RT, RE, TT commands are all cleared.

Report the configuration

ST

Reports all the channel settings. Typical output is:

CH 1, MD 1, S 100.0 DL 10us, PU 1.000ms, RT 1.020ms, IP1,FL0, CS0.000A, RA24V
CH 2, MD 1, S 100.0 DL 10us, PU 1.000ms, RT 1.020ms, IP1,FL0, CS0.000A, RA36V

Where the numeric values are:

CH	Channel number
MD	Mode: 1 = pulse, 2 = switched
S	Brightness percentage setting
DL	Pulse delay
PU	Pulse width
RT	Retrigger delay

IP, FL, CS, RA Unused

ST0

Reports the general settings. Typical output is:

TM 1, TP 20.00ms

Where:

TM	Internal trigger: 0 = off, 1 = on
TP	Internal trigger period

STc

Reports settings for a single channel.

c	1 = Light strobe output , 2 = Trigger output signal

Simulate an Input Trigger

TR1

Simulates a trigger pulse. If the channel is in pulse mode it emits a single pulse.

Enable Ethernet Messages

GTm

m = 0 to disable Ethernet messages
= 1 to enable Ethernet messages

When Ethernet messages are enabled, any error reports are sent to the most recent UDP or TCP address from which a command has been received.

Messages are of the form:

Evt1,e

Where v event value:
32 to 47 Lighting error code

Clear any Errors

GR

If Ethernet messages are not enabled, the last event or error number can be read by this command. If there was a lighting error, the VTR4 resumes normal operation.

The reply is in the same form as the GT command above. If there are no outstanding events or errors, then only the prompt “>” is returned.

Set/Clear the Webpage Password

EY

EY asc1, asc2, asc3, asc4, asc5, asc6

This command sets the password required to access the webpages. If EY is entered on its own then the password is cleared. There are six optional parameters, which are decimal ASCII values for a password from one to six letters. A value of 65 is ‘A’, 66 is ‘B’, etc to 90 is ‘Z’.

10.3.2 Command Summary

Command	Example	Effect
AW	AW	Save changes
CL	CL	Clear configuration
ST	ST	Show configuration
GT	GT1	Enable Ethernet messages
GR	GR	Clear any error condition.
EY	EY65,66	Set webpage password to “AB”
VR	VR	Read the firmware version
RW	RW1,50	Set channel 1 to 50%, switch mode
RT	RT1,3,100us,50	Set light to strobe with 3ms pulses, delayed by 100us, at 50% brightness
RE	RE1,4	Trigger on falling edge of trigger input
TT	TT1,100ms	Set internal triggers every 100ms
TR	TR1	Trigger an output pulse

A. Ratings

The electrical ratings of the connections are:

Signal	Rating
Power Input	24VDC +/- 10%. Maximum ripple 10%. Other power supply options available.
Trigger Input	Opto-coupler input: ~1Kohm series R. 0V to 2V is a logic 0. 5 to 24V is a logic 1, drawing between 3.5 and 22.5mA.
Trigger Output	Opto coupler transistor output: Maximum switched voltage Vceo = 30V Load current should be externally limited to 50mA max.

B. Restrictions

The minimum pulse delay for the light pulse output is approximately 2us. When using the retrigger delay, the minimum delay is approximately 5us.

For pulse widths less than approximately 70us fault detection does not operate.

The minimum delay for the trigger output is approximately 2us.

C. Error Codes

Error number	Reason
Err 1	A parameter value is invalid
Err 2	Command not recognised
Err 3	Numeric value is wrong format
Err 4	Wrong number of parameters
Err 5	This is a warning, not an error. One of the parameters is out of range. The value of the parameter has been adjusted. For example, sending an RT command with a delay of 0 results in "Err 5". The command is accepted but the delay is set to the minimum allowed.
Err 8, 12	EEPROM corrupt. The configuration has been cleared.
Err 9, 20	Couldn't save settings to EEPROM.
Err 27	Can't read Ethernet settings from EEPROM, so these may be incorrect.
Err 33	The VTR4 is too hot. The VTR4 has a thermal cutout which operates around 65^{O}c to 70^{O}c, depending on conditions.
Err 35	One of the lighting strings has failed. The light continues to operate but may have slightly reduced brightness. NOT YET IMPLEMENTED
Err 36	One of the lighting strings has failed and the light cannot operate. NOT YET IMPLEMENTED

Any other errors are internal errors.

D. Event Codes

Event messages are sent when an error occurs. The format of these is:

Evt<channel>,<event code>;

These event messages are only sent after the GT1 command has been sent.

Event number	Reason
1 to 127	An error has occurred. The error code is given by the event number.
130	The temperature of the light is too high and operation has been stopped.
148	The allowed duty cycle is now normal (after event 149).
149	The allowed duty cycle has been reduced due to high internal temperature.

Gardasoft LED Lighting Controllers

The products available at the time of writing include the following. Other products are also available. See www.gardasoft.com for details of the current range.

RT Range

- 2, 4 or 8 output channels up to 20A each
- 2, 4 or 8 trigger inputs
- SafePower™ and SafeSense™
- Front panel, RS232 or Ethernet configuration
- Fast pulsing option

RT200-20	Lighting controller: 2 channels up to 20A pulsing, front panel
RT220-20	Lighting controller: 2 channels up to 20A pulsing, Ethernet
RT260-20	Lighting controller: 2 channels up to 20A pulsing, RS232
RT200F-20	Lighting controller: 2 channels up to 20A fast pulsing, front panel
RT220F-20	Lighting controller: 2 channels up to 20A fast pulsing, Ethernet
RT260F-20	Lighting controller: 2 channels up to 20A fast pulsing, RS232
RT420-20	Lighting controller: 4 channels up to 20A pulsing, Ethernet
RT420F-20	Lighting controller: 4 channels up to 20A fast pulsing, Ethernet
RT820F-20	Lighting controller: 8 channels up to 20A fast pulsing, Ethernet
RT860F-20	Lighting controller: 8 channels up to 20A fast pulsing, RS232

PP704	DIN Rail mounting clip for RT range

PP Range

- 2, 4 or 8 output channels up to 20A each
- 2, 4 or 8 trigger inputs
- SafeSense™ option
- Front panel, RS232 or Ethernet configuration
- Fast pulsing option

The PP range will continue to be available for many years.

Machine Vision Timing Controller

CC320 Controller

- 8 digital inputs
- 8 digital outputs
- 1 or 2 wire Encoder input
- Very flexible operation
- Ethernet control
- Front panel configuration

PP703	DIN Rail mounting clip for CC320

Gardasoft Traffic Strobe Lights

The products available at the time of writing include the following. Other products are also available. See www.gardasoft.com for details of the current range.

VTR1 Range

- Up to 300W per steradian output power
- Infra red 740nm, 850nm, 940nm and white options
- Ethernet and RS232 options
- Trigger input and trigger output options
- 12 degree and 30 degree beam angle options

VTR2 Range

- Up to 3000W per steradian output power
- Infra red 740nm, 850nm, 940nm and white options
- Ethernet and RS232 options
- Trigger input and trigger output options
- 12 degree and 30 degree beam angle options